



# The Power of Soil: Increasing Practice Adoption with Learning, Incentives and Economics



*Paul Smith and Aaron Delaporte*

**Soil Summit, November 2021**



Possibility grows here.



# Outline

- Purpose and Context of the Power of Soils Project
- Synthesis of science, social science, policy and economics
- Recommendations on learning tools and incentives to support soil health
- Preliminary results for the economics of soil health practices in Ontario



# Project Purpose and Context



Image: OMAFRA

## Purpose

- Build evidence to support widespread adoption of soil health practices
  - Science, social science, policy, economics → Recommendations

## Context

- Soil health benefits farm profits, environment, water quality, climate
- Existing policies have helped, but progress is modest
- Policy innovation needed for significant progress
- Focus on voluntary stewardship, non-regulatory tools

## Partners

- 2019-2022 - Led by Équiterre nationally, Ontario lead is Greenbelt Foundation
- National, Ontario, and Quebec advisory committees: farm groups, scientists, conservation groups; engagement workshops

Funders:

**METCALF  
FOUNDATION**

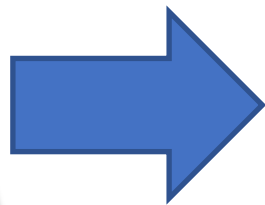
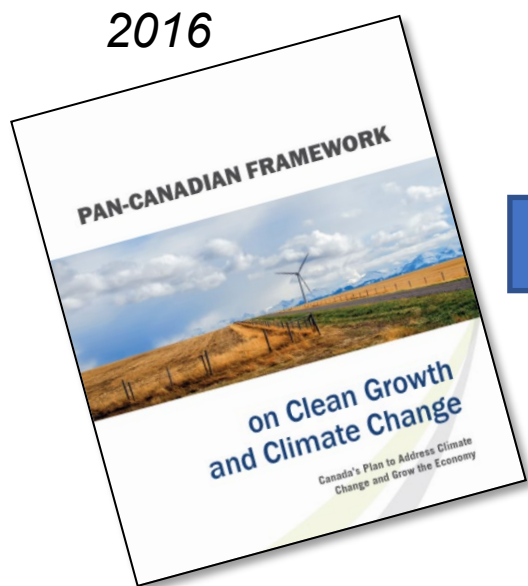


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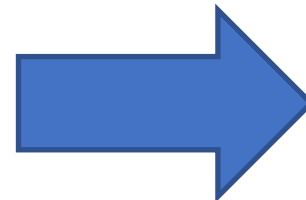
# Power of Soils, evidence to influence policy

**Climate  
Policy**

**Agriculture  
Policy**



Budget 2021



Program  
Details



Consultation in 2022



New  
framework  
2023

*Opportunities for more action on soil health*

# The Power of Soil report synthesizes evidence...



**1. Science** of soil health practices: review of science on practices, benefits, limitations;

**2. Social science:** how and why farmers adopt soil health practices, motivations, barriers;

**3. Policy:** review soil health and agri-environmental policy, other jurisdictions, policy innovations;

**4. Economics** of soil health practices

**5. Recommendations.**





# Recommendations



Prioritize soil health



Enhance soil health knowledge & learning



Incentivize soil health



Conserve agricultural land & natural areas



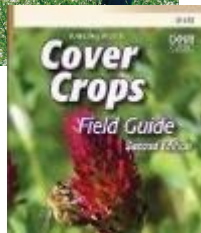
# Enhance soil health knowledge & learning

## Build Soil Knowledge and Extension Services

- National 'Soil Health Network' to develop, promote, make accessible soil health knowledge
- Ensure soil health training for advisors & farmers
- Build capacity for on-farm demonstration
- Enhance farmer-to-farmer learning opportunities
- Enhance public sector capacity for extension & research

## Tools to Support Action

- Make business case for soil health (build on work in US) ★
- Develop national soil health planning tool adapted to regions
- Consistent support for key soil health practices
- National reporting on state of soil health





# Incentivize soil health

## Increase funding for on-farm soil health

- Canada spends small fraction on agri-environment compared to US, EU
- New federal climate plan funding for nature-based solutions
  - Budget 2021
  - Need increases in next 5-year agreement 2023-2028

## Fund simple, low risk projects

- New approach to fund low cost, low risk projects, e.g. cover crops
- Few requirements, attract new participants

## Reduce the risk of innovation

- BMP insurance (insure against losses due to BMPs), crop insurance discounts, grants for innovation

## Use GHG offset protocols to fund soil health



*Image: Trimble*

# Toward a Business Case for soil health

- Synthesize knowledge on economics of soil health in Ontario drawing on studies in Ontario and similar jurisdictions
- Estimate costs and benefits of soil health practices in Ontario where possible
- Build on work in US by Soil Health Institute, American Farmland Trust, National Association of Conservation Districts and others
- Identify what is known and what needs further study, e.g. commodities, production systems, practices
- Recommendations on how to undertake more comprehensive study of soil health economics
- Sneak peek at preliminary results of economics for four practices in Ontario



# Tillage Intensity (No till)



Images: OMAFRA

- Revenue: Potential yield losses early in adoption decrease over time to near zero yield effect
- Cost: Fewer field operations saving machinery and labour

		Year 1		Year 3		Year 5	
		Corn	Soy	Corn	Soy	Corn	Soy
<b>Yield Change (%)</b>		-9	-5	-5	-4	-2	0
<b>Revenue Change (\$/ac)</b>	High	-56	-12	-31	-20	-31	0
	Low	-93	-16	-52	-26	-52	0
<b>Cost Savings (\$/ac)</b>		36	27	36	27	36	27
<b>Crop Net Return (\$/ac)</b>	High	-20	15	5	8	5	27
	Low	-57	12	-16	1	-16	27
<b>Net Return (\$/ac)</b>		-13		-1		11	



# Cover Crops (50%-50% Legume-Grass Mix)

- Revenue: Increasing yield over seasons, nitrogen credit
- Costs: Seed, planting, termination
- Grass cover crops have lower N credits



		Year 1		Year 3		Year 5	
		Corn	Soy	Corn	Soy	Corn	Soy
<b>Yield Change (%)</b>		0.5	2.1	1.8	3.5	3	5
<b>Revenue Change (\$/ac)</b>	High	5	16	19	26	31	37
	Low	3	12	11	20	19	28
<b>Added Costs (\$/ac)</b>	High	100		100		100	
	Low	56		56		56	
<b>N Savings (\$/ac)</b>	High	53		53		53	
	Low	26		26		26	
<b>Crop Net Return (\$/ac)</b>	High	2	16	15	26	28	37
	Low	-70	12	-4	20	19	28
<b>Net Return (\$/ac)</b>		-10		14		28	

# Crop Rotation (Including Wheat)



Photo: U of Nebraska

- Revenue: Increased yield from including small grain
- Cost: Wheat typically has lower returns than corn and soybean

		Year 1			Year 4		
		Corn	Soy	Wheat	Corn	Soy	Wheat
<b>Yield Change (%)</b>		0	0	0	7	12	0
<b>Cost (\$/ac)</b>	High	-805	-444	-435	-827	-461	-452
	Low	-655	-409	-399	-573	-422	-416
<b>Revenue (\$/ac)</b>	High	955	722	621	1022	809	621
	Low	588	545	386	630	611	386
<b>Crop Net Return (\$/ac)</b>	High	151	278	185	342	348	185
	Low	-66	136	-13	110	189	-13
<b>Mean Net Return (\$/ac)</b>		132			193		
<b>Change from C-S (\$/ac)</b>		-9			52		

# Nutrient Management (4R)



Photo: U of Minnesota

- 4R Nutrient Stewardship: Right Timing, Right Source, Right Rate, Right Placement
- Revenue: Changes in yield based on N use efficiency
- Cost: Alternate practices have different costs

	Practice							
	Split N Application		Inhibitor Application		Rate Reduction		Variable Rate N Application	
	Low	High	Low	High	Low	High	Low	High
<b>Yield Change (%)</b>	-1.2	3.7	0.3	9.3	-2.8	0	-2.1	4.4
<b>Revenue Change (\$/ac)</b>	-11	34	3	86	-26	0	-19	41
<b>Cost Change (\$/ac)</b>	11	11	32	16	-44	-22	21	12
<b>Net Return (\$/ac)</b>	-22	23	-30	70	18	22	-40	29



# Next steps

- Build support for recommendations
- Engagement, outreach
- Influence implementation of Federal Climate Plan
- Influence next agricultural policy framework
- Finish initial work on economics of soil health
  - Translate results into extension materials



Photo: M. Luymes



**Report available:**

<https://www.equiterre.org/en/news/systemic-change-is-needed-in-canadian-agriculture-and-why-it-matters-to-you-0>

[https://www.greenbelt.ca/the\\_power\\_of\\_soil](https://www.greenbelt.ca/the_power_of_soil)